DOW# 69-0696

West Twin Lake

West Twin Lake has a surface area of 120.4 acres and is located on the east side of St. Louis County Road 31, south of Highway 2. West Twin Lake has a maximum depth of 18 feet (Figure 1) and an average depth and clarity of 5 feet. The lake is accessed using the public boat landing just off the east side of county road 31. It is a moderately stained (mean filtered color = 50 PtCo units), soft-water (mean total hardness = 24.26 mg/l as $CaCO_3$), moderately productive or mesotrophic lake, with a calculated Carlson's Trophic State Index of 48.86, based upon total phosphorus, chlorophyll a, and secchi depth. It has a double-basin morphometry, with a shallow gravel bar extending from a point at the narrowest part of the lake.

Trap net and gill net locations were selected based on previous Minnesota Department of Natural Resources (MNDNR) lake surveys (Figure 1). Two gill nets and nine trap nets were set August 18-20, slightly less gear than the MNDNR used in their 2005 survey. The purpose of this survey was to collect base line data of fish communities, and use this data to direct future management decisions. Fish species observed in 2008 included pumpkinseed sunfish (PMK), bluegill (BLG), black crappie (BLC), and to a lesser degree northern pike (NOP), walleye (WAE), yellow perch (YEP), smallmouth bass (SMB) and white sucker (WTS) (Table 1).

When our 2008 catch data is compared to that of the MNDNR, all MNDNR data is reported from their Lake Finder website www.dnr.state.mn.us/lakefind . While fewer nets were set in 2008 relative to the number set in 2005, several comparisons are still possible. Between the two surveys, there is little evidence to suggest that the population of black crappie or northern pike has changed (Table 1). In 2005, MNDNR sampled 4.6 PMK / trap net, compared to 26.7 in 2008, suggesting that the PMK population is much larger in 2008. Walleye and yellow perch catch rates were much lower in 2008 than in 2005 (Table 1).

Pumpkinseeds were observed between 80 mm and 180 mm (Figure 2). Catch rates were 10.5 / GN, up from 2.0 / GN in 2001, and 26.7 / TN in 2008, up from 4.6 / TN in 2001 (Table 1). PMK between the ages of 2 to 4 years old made up 98% of the sample (Table 2). 2008 data suggests that PMK in West Twin grow slower than the Duluth Area average (John Lindgren, MNDNR, personal communication), where slow growth was observed beginning at age 2, and individuals were one full year behind the MNDNR Duluth Area growth average by age-4 (Table 3). Stock density indices, e.g. PSD (proportional stock density), are used as a quality index for a fish population, and describe fish in terms of specific length categories. The PSD value for this PMK population was 0.0 ± 0.0, meaning that 0% of the population was larger than a determined "quality" length. Ideally, a population will have a PSD between

30 and 60. This low PSD, along with the lack of older individuals in the population, suggests that pumpkinseeds are being overharvested in West Twin Lake.

Walleye were observed between 463 mm to 686 mm (Figure 3). Catch rates of 1.5 / GN in 2008 were down from 3.3 / GN in 2001, and 0.4 / TN in 2008 compared to 1.4 / TN in 2001 (Table 1). The MNDNR stocked West Twin Lake with 200,000 WAE fry in 2001, 2003, and 2005. None of the seven WAE collected and aged corresponds to any of the MNDNR stocking efforts from those years (Table 4). Of the WAE collected in the 2008 survey, the smallest WAE was 18.2 inches at 4-years old, and the largest WAE was 26.6 inches at 22-years old. Growth rates are average for this area (Table 5).

Black crappies were observed between 110 mm to 277 mm (Figure 4). BLC were sampled at 3.0 / GN in 2008, up from 1.5 / GN in 2001, and 3.1 / TN in 2008 down from the 2001 survey at 4.3 / TN (Table 1). The results of our efforts indicate a stable BLC age distribution showing 82% of the population between the ages of 3 and 7 years old (Table 6). Growth rates observed in 2008 were slightly slower, though not significantly slower, than the MNDNR Duluth Area average (Table 7). The PSD for black crappie was 38.7 ± 17.2, which does suggest a balanced population of small and large fish, though this value may be on the low side of "balanced". Given the even distribution of year classes (Table 6), angling overharvest does not appear to be limiting this population, though it could be influencing the size structure to some extent.

Bluegills were observed between 56 mm to 141 mm (Figure 5). The 2008 survey yielded 0.0 / GN, same as the 2001 survey, and 6.3 / TN up from 0.0 / TN in 2001 (Table 1). The age frequency distribution for BLG shows 85% of the population consisted of 2 and 3-year old fish, 12% were 4-year olds, and 3% were 5-years of age (Table 8). Growth rates for BLG are slightly higher from age-0 to age-3 than the MNDNR Duluth area average (Table 9). The PSD value for this bluegill population was 0.0 ± 0.0, clearly indicative of a population characterized by small individuals. Further, with the lack of very many older individuals, it seems clear that this population is no doubt being overharvested.

Northern pike were observed between 180 mm to 684 mm (Figure 6). Catch rates are comparable to the 2001 survey at 6.5 / GN in 2008 and 7.8 / GN in 2001, 0.4 / TN in 2008 and a trace in 2001 (Table 1). The NOP collected from this survey by gillnets were used for mercury testing (Table 10). The NOP collected from the trap nets were measured and released. Otoliths were extracted from the NOP tested for mercury and used to age the fish. Our data show that the NOP in West Twin Lake grow slightly faster than the MNDNR Duluth area average (Table 11), where the average 2-year old is 374 mm and the average 3-year old is 485 mm (John Lindgren, personal communication). The northern pike PSD value was 13.3 ± 17.2, lower than what is expected in a healthy population. Given the few year classes observed in the age data (Table 11), it seems highly plausible that angling overharvest may be responsible for this imbalance. Within many populations of northern pike in Minnesota, production is often much

lower than is mortality. The size structures of many populations of northern pike are shaped by angling (over)harvest (Rod Pierce, MNDNR, personal communication).

Eight NOP were analyzed for total mercury, with wet weight concentrations ranging between 0.103 – 0.178 µg/g, which is generally lower than expected for NOP in this region; these concentrations lie between the "unrestricted" and safe consumption advisory of one meal/week for the general population, and one meal/week for the sensitive population. A single large (646 mm or over 25") walleye was analyzed for total mercury, with a result of 0.804 µg/g wet weight. General consumption advice for walleye over 20" is "do not eat" for the sensitive population, and one meal/month for the general population.

Seven YEP (Figure 7), one SMB, and one WTS were also observed during this survey.

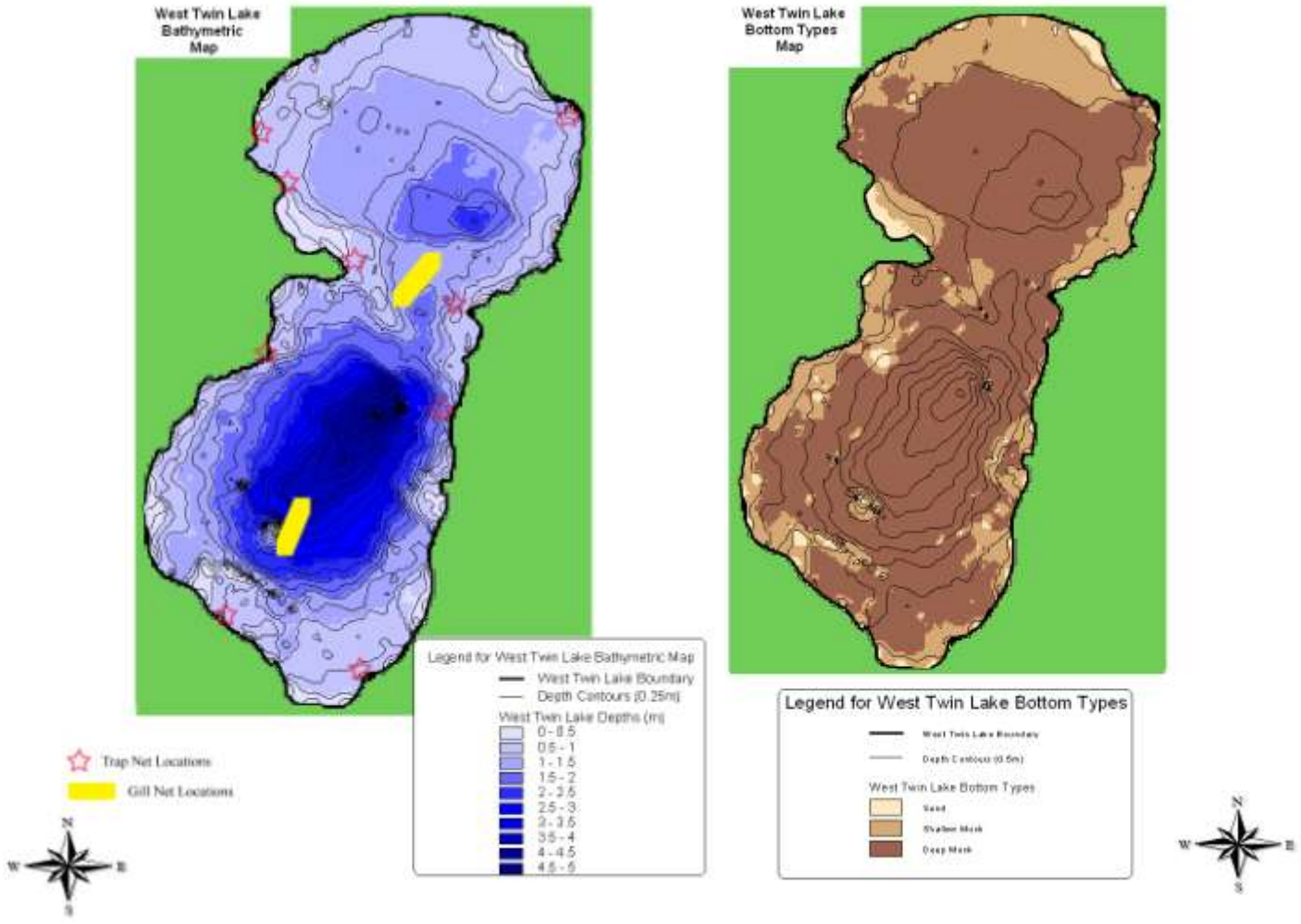

Figure 1. Map of West Twin Lake, St. Louis County, the left panel presents depth data along with locations of trap nets and gill nets set in 2008. The right panel presents the bottom substrate data for West Twin Lake in 2008.

Table 1. Fish species sampled in West Twin Lake, August 2008, by gear type and ID. Catch-per-effort data (# Fish / net type) is also included.

	---------- SPECIES CODE ----------								
Gear I D	BLC	BLG	NOP	PMK	SMB	WAE	WTS	YEP	Grand Total
GN 1	4		6	7	1	3	1	2	24
GN 2	2		7	14				2	26
TN 1	3	22		32		1			58
TN 2	1	3	1	1		1			7
TN 3	3	5	1	31		1			41
TN 4		5		23					28
TN 5	2	9	2	60				1	74
TN 6	2	9		68				1	80
TN 8	16	3		10		1			30
TN 9	1	1		15				1	18
Count of Species	34	57	17	261	1	7	1	7	386
# Fish / GN	3.0	---	6.5	10.5	0.5	1.5	0.5	2.0	
# Fish / TN	3.1	6.3	0.4	26.7	---	0.4	---	0.3	
DNR Fish / GN[1]	1.5		7.8	2.0		3.3		5.3	
DNR Fish / TN[1]	4.3		Trace	4.6		1.4		0.6	

1 Data reported was obtained from the MNDNR website www.dnr.state.mn.us/lakefind

Table 2. Age frequency distribution of pumpkinseed sunfish sampled from West Twin Lake, August 2008.

Length (mm)	Length (in)	# Observed	1	2	3	4	5
70	2.8						
80	3.1	4		4			
90	3.5	83		50	33		
100	3.9	74			74		
110	4.3	27		5	22		
120	4.7	25				25	
130	5.1	25			4	21	
140	5.5	11			8		3
150	5.9	2			2		
160	6.3	5			4	1	
170	6.7	4			2	2	
180	7.1	1				1	
190	7.5						
	Total			59	149	50	3

Table 3. Back-calculated length at age estimates for pumpkinseed sunfish in West Twin Lake 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length (mm)	Area Average Length (in)
1	45	53	2.1	46	1.8
2	45	87	3.4	104	4.1
3	38	118	4.6	130	5.1
4	15	133	5.2	165	6.5
5	1	135	5.3	196	7.7

Table 4. Age frequency distribution for walleye sampled from West Twin Lake 2008.

Length (mm)	Age
463	4
630	10
639	11
610	12
675	14
686	14
675	22

Table 5. Back-calculated length at age estimates for walleye sampled from West Twin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length (mm)	Area Average Length (in)
1	6	114	4.5	127	5
2	6	194	7.6	229	9
3	6	302	11.9	312	12.3
4	6	376	14.8	383	15
5	5	429	16.9	441	17.4
6	5	463	18.2	482	19
7	5	502	19.8	514	20.2
8	5	535	21.1	537	21.1
9	5	568	22.4		
10	5	595	23.4		
11	4	613	24.1		
12	3	633	24.9		
13	2	667	26.2		
14	2	674	26.5		

Table 6. Age frequency distributions for black crappie sampled from West Twin Lake 2008.

Count of Age	Age							
Length (in)	1	2	3	4	5	6	7	Grand Total
110	3							3
140			1					1
150		1	3					4
160			2					2
170			2					2
180				2				2
190				1				1
200				1	2			3
210				1		1		2
230					1	2		3
240						1	1	2
260						1		1
270					1			1
Grand Total	3	1	8	5	4	5	1	27

Table 7. Length at age estimates for black crappie sampled from West Twin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length (mm)	Area Average Length (in)
1	27	58	2.3	46	1.8
2	24	101	4.0	100	3.9
3	23	136	5.4	155	6.1
4	15	175	6.9	196	7.7
5	10	204	8.0	227	8.9
6	6	222	8.7	242	9.5
7	1	234	9.2	247	9.7

Table 8. Age frequency distribution for bluegill observed in West Twin Lake 2008.

Length (mm)	Length (in)	# Observed	1	2	3	4	5
50	2.0	1					
60	2.4						
70	2.8						
80	3.1						
90	3.5	1					
100	3.9	8		6	2		
110	4.3	17		3	14		
120	4.7	16		13	3		
130	5.1	10			4	6	
140	5.5	4			2	1	1
150	5.9						
	Total	57		22	25	7	1

Table 9. Length at age estimates for bluegill sampled from West Twin Lake in 2008, compared to the area averages established by the Minnesota Department of Natural Resources. N is the sample size used for the estimates.

Age Class	N	Length (mm)	Length (in)	Area Average Length (mm)	Area Average Length (in)
1	25	46	1.8	36	1.4
2	25	85	3.3	64	2.5
3	16	111	4.4	97	3.8
4	5	124	4.9	127	5.0
5	1	137	5.4	152	6.0

Table 10. Mercury analysis results for northern pike and walleye, measured in micrograms of mercury per gram of fish tissue (µg/g), for West Twin Lake 2008.

Species	Length (mm)	Length (in)	µg/g Tissue
NOP	510	20.1	0.177
NOP	532	20.9	0.169
NOP	498	19.6	0.108
NOP	517	20.4	0.171
NOP	430	16.9	0.103
NOP	510	20.1	0.127
NOP	446	17.6	0.114
NOP	677	26.6	0.178
WAE	646	25.4	0.804

Table 11. Age frequency distribution for northern pike sampled from West Twin Lake 2008.

Length (mm)	Length (in)	2	3
430	16.9	1	
440	17.3	1	
490	19.3	1	
510	20.1		3
530	20.9		1
670	26.4		1
	Total	3	5

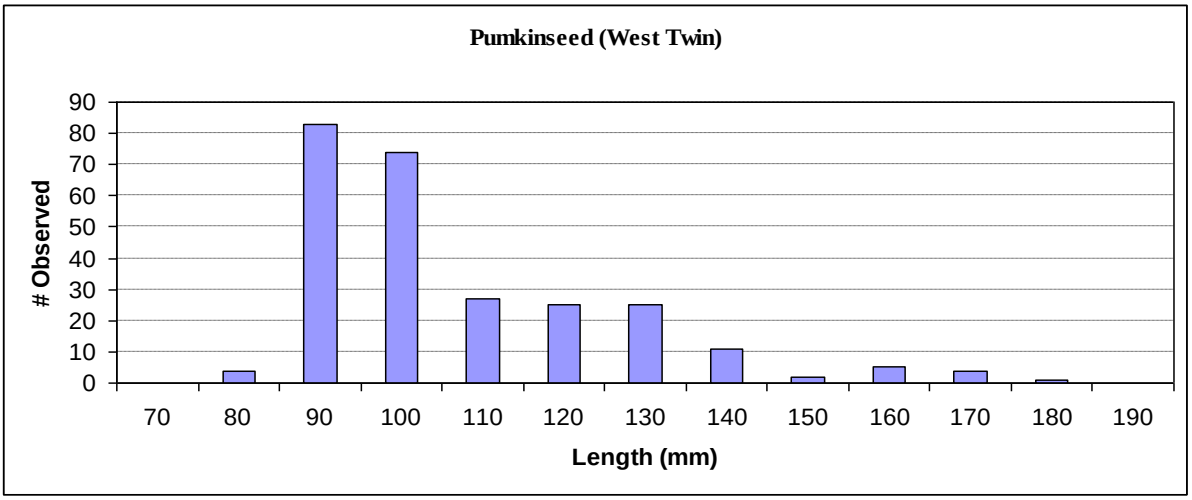

Figure 2. Length frequency distribution of pumpkinseed sunfish observed in West Twin Lake 2008.

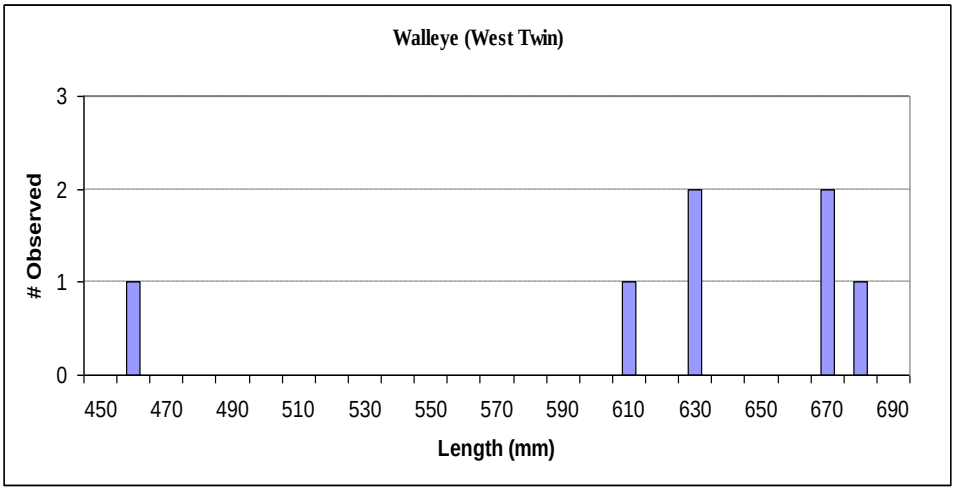

Figure 3. Length frequency distribution of walleye observed in West Twin Lake 2008.

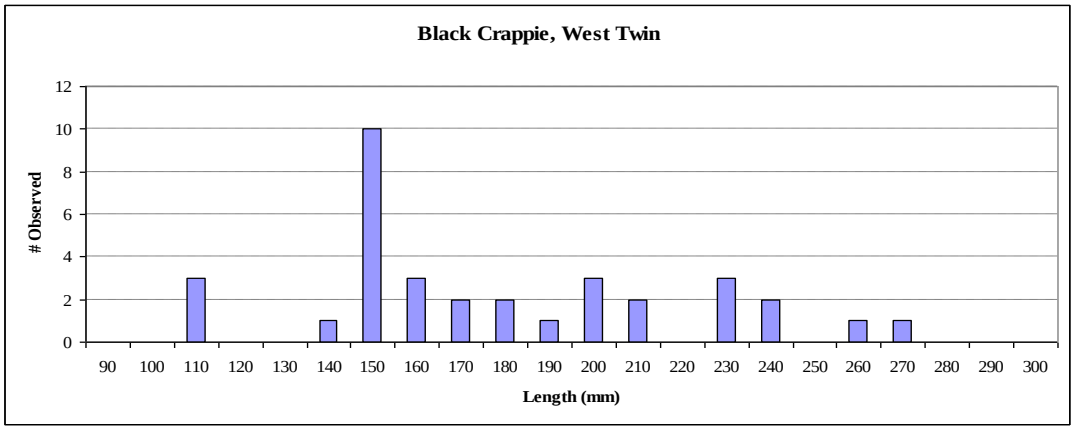

Figure 4. Length frequency distribution of black crappie observed in West Twin Lake 2008.

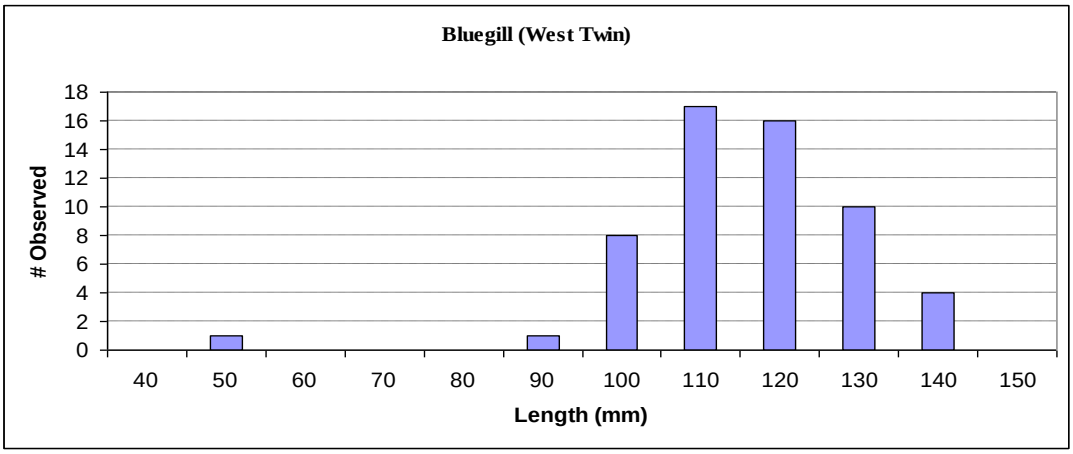

Figure 5. Length frequency distribution of blue gill observed in West Twin Lake 2008.

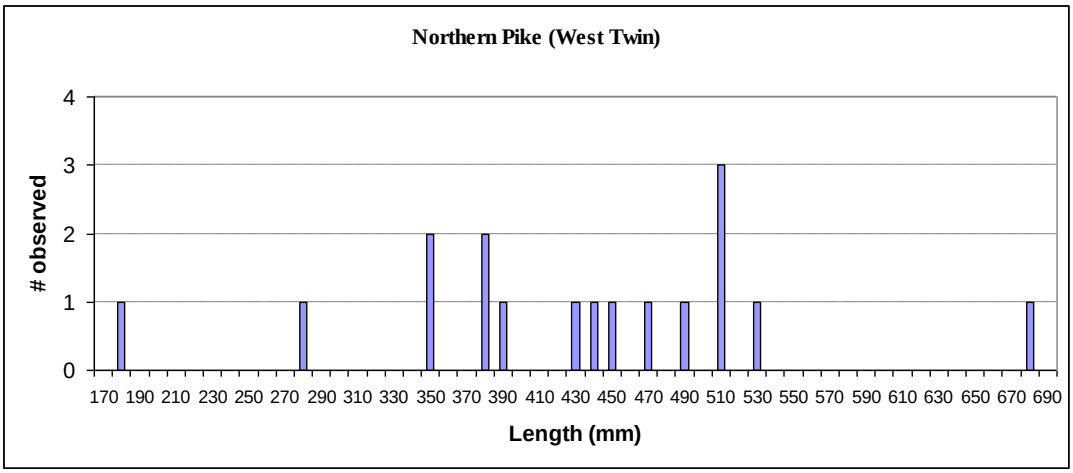

Figure 6. Length frequency distribution of northern pike observed in West Twin Lake 2008.

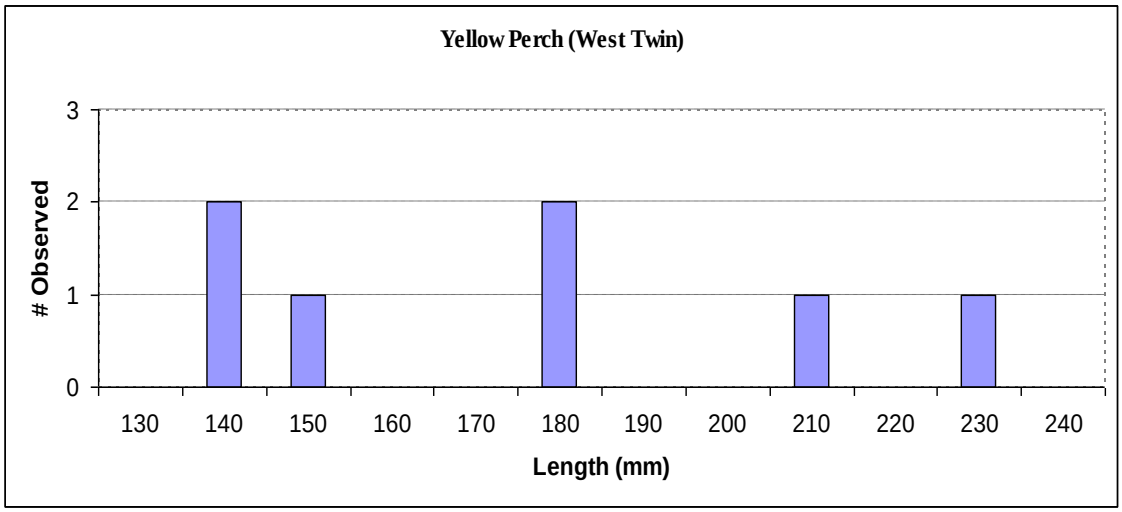

Figure 7. Length frequency distribution of yellow perch observed in West Twin Lake 2008.